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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/676,411

09/30/2003

Robert Bristol

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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT

PAPER NUMBER

1756

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

03/08/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/676,411

Applicant(s)

BRISTOL ET AL.

Examiner

Daborah Chacko-Davis

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 7-11, 15-19, and 23-24, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 5,565,304 (Honda).

Honda, in col 3, lines 40-59, in col 4, lines 28-30, in col 5, lines 34-46, in col 8, lines 10-20, and lines 45-52, discloses a method of forming a pattern in a semiconductor device including forming a resist layer on a device layer (etch-resistant layer), said resist layer includes a baseline material such as polyhydroxystyrene, highly absorbing material such as antimony, thinning the resist material coating to a desired thickness, and improving the efficiency of the PAG in the resist to capture the secondary electrons produced in the resist (when exposed to X-ray, the radiation generates secondary electrons in the resist, resulting in the interaction of the PAG to produce a halogen acid (PAG in the resist is triphenyl sulfonium tetrafluoroborate) that catalyses the crosslinking reactions, thereby increasing the efficiency of the PAG, and controlling the moieties generated due to irradiation (proximal to the PAG), pattern transferring the resist pattern formed to define areas of the device (claims 1-2, 7, 9-10, 15, 17-18, and 23). Honda, in col 5, lines 40-46, and in col 6, lines 53-55, discloses that the antimony is added in the claimed amount (5% to 30%) in the resist composition (claims 3, 11, and

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19). Honda, in col 8, lines 53-55, discloses that the resist layer is exposed to X-ray irradiation (claims 8, 16, and 24).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 4, 12, and 20, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent No. 6,753,129 (Livesay et al., hereinafter referred to as Livesay).

Honda is discussed in paragraph no. 2.

The difference between the claims and Honda is that Honda does not disclose the highly absorbing materials (claimed polymers) recited in claims 4, 12, and 20.

Livesay, in col 8, lines 45-58, discloses that the resist composition includes a fluoropolymer.

Therefore, it would be obvious to a skilled artisan to modify Honda by employing the absorbing material suggested by Livesay because Livesay, in col 5, lines 55-61, in col 7, lines 60-67, and in col 8, lines 20-57, discloses that adding fluoro polymers in resist compositions enables the formation of a uniform film on the substrate, and increases the surface hardness and dry etch resistance of the resist pattern.

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5. Claims 5, 13, and 21, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent No. 7,049,044 (Gonsalves et al., hereinafter referred to as Gonsalves).

Honda is discussed in paragraph no. 2.

The difference between the claims and Honda is that Honda does not disclose that the resist layer is thinned to a thickness below 100nm (claims 5, 13, and 21).

Gonsalves, in col 14, lines 25-34, discloses forming a thin layer of resist with a thickness less than 100nm.

Therefore, it would be obvious to a skilled artisan to modify Honda by employing the thickness range suggested by Gonsalves because Honda, in col 8, lines 10-21, discloses thinning the resist layer to a desired thickness and Gonsalves, in col 2, lines 1-25, teaches using the resist layer compositions to form sub-100nm patterning in order to be applicable for next generation lithography.

6. Claims 6, 14, and 22, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent No. 5,034,304 (Feely).

Honda is discussed in paragraph no. 2.

The difference between the claims and Honda is that Honda does not disclose increasing the PAG (photoacid generator) concentration in the resist (claims 6, 14, and 22).

Feely, in col 6, lines 15-35, discloses increasing the PAG concentration in the resist composition.

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Therefore, it would be obvious to a skilled artisan to modify Honda by increasing the concentration of the PAG in the resist as suggested by Feely because Feely, in col 6, lines 15-35, discloses using higher concentrations of PAG in the resist enables the resist to be imageable in X-ray wavelengths, and enables the formation of a much higher image resolution.

7. Claims 25-27, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent Application Publication No. 2003/0003393 (Yamaguchi et al., hereinafter referred to as Yamaguchi).

Honda is discussed in paragraph no. 2.

The difference between the claims and Honda is that Honda does not disclose that the thickness is balanced with dosage of radiation exposure to have an overall transmission of approximately 50%.

Yamaguchi, in [0071], [0072], [0074], discloses that the thickness of the photoresist film and the amount of light used for exposure is adjusted so as to obtain an absorption coefficient of about ≤ 7 which is approximately 50% transmittance.

Therefore, it would be obvious to a skilled artisan to modify Honda by employing the method of adjusting the photoresist or imaging layer thickness in order to achieve the desired transmittance as suggested by Yamaguchi because Yamaguchi, in [0035], discloses that employing a smaller layer thickness in the photoresist layer increase the light utilization efficiency and improves the pattern rectangularity by reducing the reflection from the substrate.

Response to Arguments

8. Applicant's arguments filed December 8, 2006, have been fully considered but they are not persuasive. The 102 and 103 rejections made in the previous office action (paper no. 20060908) are maintained. Applicant's arguments with respect to claims 25-27, filed December 8, 2006, have been considered but are moot in view of the new ground(s) of rejection. See paragraph no. 7.

A) Applicants argue that Honda does not teach a baseline material added by a highly absorbing material selected from the group recited in claims 1, 3, 9, 11, 17, and 19.

Honda, in col 4, lines 28-47, teaches a photoresist composition that includes a baseline material such as polyhydroxystyrene, and Honda in col 5, lines 40-67, and in col 6, lines 52-55, discloses highly absorbing salts (material) of antimony added in the claims percentage (about 5% to 30%) along with the baseline material to form the resist material composition. Therefore, Honda does teach the claimed resist material composition.

B) Applicants argue that Honda does not teach thinning of the resist to a 100nm thickness.

Honda is not relied upon to disclose thinning the resist to about 100nm. Gonsalves is relied upon to disclose thinning the resist to a thickness less than 100nm.

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Also, Honda teaches different spinning techniques in order to obtain a resist film of desired thickness.

C) Applicants argue that Honda and Livesay do not disclose the claimed percentage of the materials recited in claims 4, 12, and 20.

Honda discloses highly absorbing material in the claimed percentage (see column 6, lines 53-55) about 5% to 30%. Livesay is not depended upon to disclose the percentage of the highly absorbing material. Livesay is depended upon to disclose the use of the claimed highly absorbing material such as fluoropolymer in the resist composition.

D) Applicants argue that none of the cited materials disclose the cited materials (claimed highly absorbing material) in the percentage ranging from 10% to 20%.

See paragraphs A), and C). Additionally, Honda is relied upon to disclose the use of highly absorbing materials in the claimed percentage (i.e., from about 5% to 30%).

E) Applicants argue Honda and Feely do not disclose increasing a PAG concentration in the resist.

Honda is not relied upon to teach increasing PAG concentration. Feely teaches that increasing the PAG concentration in the resist composition (see column 6, lines 15-50).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

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applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

MD

March 2, 2007.

A handwritten signature in black ink, appearing to read "Mark 2" followed by a stylized flourish.

LOREN E. MUST
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700